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**(54) Title:** DISINFECTANT COMPOSITIONS

**(57) Abstract**

A disinfectant composition which is compatible with foodstuffs and beverages, said composition comprising: (a) an anionic surfactant chosen from an alkali metal salt of a C<sub>10</sub>-C<sub>18</sub> alkyl sulphate and an alkali metal salt of di(C<sub>6</sub>-C<sub>10</sub> alkyl) sulphosuccinate; (b) an acid selected from citric acid, phosphoric acid, sulphuric acid, hydrochloric acid, acetic acid, gluconic acid, lactic acid, propionic acid, malic acid and tartaric acid; and (c) a non-ionic surfactant which comprises a polyethoxylated sorbitan ester which is readily soluble in water.

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## **DISINFECTANT COMPOSITIONS**

### **FIELD OF THE INVENTION**

The present invention relates to disinfectant compositions, in particular  
5 to disinfectant compositions which are compatible with foodstuffs and  
beverages.

### **BACKGROUND OF THE INVENTION**

There is a need in the processed food industry for disinfectants in liquid  
form which are compatible with foodstuffs and beverages, and which are stable  
10 when diluted with hard water and/or are stable when a concentrate of the  
disinfectant composition is stored. Ideally, the concentrate should remain  
stable for at least 3 months at room temperature, and more preferably for at  
least 2 months at -1 °C.

As far as we are aware, there are no disinfectant compositions currently  
15 on the market which are food compatible and which at the same time are stable  
when diluted in hard water or in which a concentrated form of the disinfectant  
is stable for periods of 2 months or more, particularly at low temperatures,  
typically at temperatures down to -1 °C.

Canadian Patent No. 1244759 discloses that the combination of alkyl  
20 sulphonates and/or alkyl sulphates with one or more specifically mentioned  
organic acids displays an unexpectedly broad spectrum of microbiocidal and  
virucidal activity in very low use concentrations at which the individual  
components of the combination do not exhibit any microbicidal activity.

US Patent No. 3650964 discloses sanitizer compositions intended to  
25 have low foaming properties. Anionic surface active agents are combined with  
an acid and may also contain a solubilising agent and/or a low foaming non-  
ionic surface active agent.

W092/09260 discloses sanitising compositions which comprise an  
anionic surfactant and an acidic component. Non-aqueous concentrates are  
30 disclosed which may be in the form of a solid dry composition or in the form of

a liquid mixture in an anhydrous liquid carrier. Solutions of the compositions are found to have excellent antibacterial activity.

DE-A-3519557 discloses skin disinfectant compositions which incorporate a non-ionic surfactant, a diluting agent and, preferably, a benzyl-substituted quarternary ammonium compound. The compositions are reported to be only mildly biocidal.

It is also well known that certain anionic surfactants act as microbiocidal agents when acidified.

We have now found that incorporation of certain soluble non-ionic surfactants into compositions of acidified anionic surfactants produces disinfectant compositions which are stable when diluted with hard water.

#### SUMMARY OF THE INVENTION

According to the present invention there is provided a disinfectant composition which is compatible with foodstuffs and beverages, said composition comprising:-

- (a) an anionic surfactant chosen from an alkali metal salt of a  $C_{10}$  -  $C_{18}$  alkyl sulphate and an alkali metal salt of di ( $C_6$  -  $C_{10}$  alkyl) sulphosuccinate;
- (b) an acid selected from citric acid, phosphoric acid, sulphuric acid, hydrochloric acid, acetic acid, gluconic acid, lactic acid, propionic acid, malic acid and tartaric acid; and
- (c) a non-ionic surfactant which comprises a polyethoxylated sorbitan ester which is readily soluble in water.

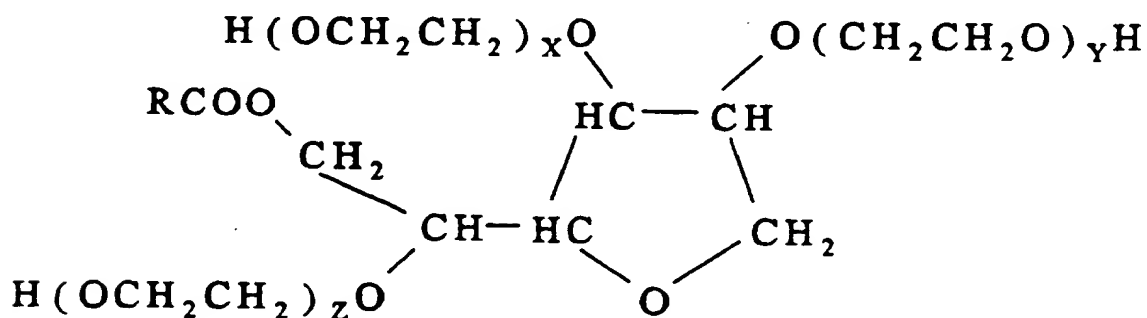
The anionic surfactant used in the disinfectant compositions of the present invention is preferably sodium lauryl sulphate or sodium dioctyl sulphosuccinate.

#### DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

The amount of anionic surfactant (a) which is usually present in the disinfectant compositions of the present invention is from 1 to 20 wt%,

preferably from 5 to 9 wt%, more preferably about 7 wt%, based on the total weight of the disinfectant composition.

The non-ionic surfactants (c) which are incorporated in the disinfectant compositions of the present invention are polyethoxylated sorbitan esters which are soluble in water. These materials have the following general structural formula (I):-



wherein R is the alkyl group of a fatty acid, typically a C<sub>12</sub> - C<sub>18</sub> fatty acid such as lauric acid, palmitic acid, stearic acid and oleic acid, and (x + y + z) is the total number of moles of ethylene oxide.

Preferably the non-ionic surfactant (c) comprises a polyethoxylated sorbitan ester selected from ethoxylated sorbitan monolaurate, ethoxylated sorbitan monopalmitate, ethoxylated sorbitan monostearate, and ethoxylated sorbitan mono-oleate. Particularly preferred such polyethoxylated sorbitan esters are those containing 20 moles of ethylene oxide.

Especially preferred non-ionic surfactants of this type are Polysorbate 20, Polysorbate 40, Polysorbate 60 and Polysorbate 80. Three of these Polysorbate compositions are described in the Food Chemicals Codex, 3rd Edition, 1981, National Academy Press, Washington DC, as:-

Polysorbate 20 is a mixture of laurate partial esters of sorbitol and sorbitol anhydrides condensed with approximately 20 moles of ethylene

oxide, (C<sub>2</sub>H<sub>4</sub>O) for each mole of sorbitol and its mono- and di-anhydrides. Polysorbate 60 is a mixture of stearate and palmitate partial esters of sorbitol and sorbitol anhydrides condensed with approximately 20 moles of ethylene oxide (C<sub>2</sub>H<sub>4</sub>O) for each mole of sorbitol and its mono- and di-anhydrides.

Polysorbate 80 is a mixture of oleate partial esters of sorbitol and sorbitol anhydrides condensed with approximately 20 moles of ethylene oxide (C<sub>2</sub>H<sub>4</sub>O) for each mole of sorbitol and its mono- and di-anhydride. Polysorbate 40 is an ethoxylated sorbitan monopalmitate containing 20 ethylene oxide groups, and is a non-ionic surfactant which is included in the EEC list of permitted food additives (see proposal for a Council Directive on food additives other than colours and sweeteners (92/C206/03) Official Journal of the European Communities No. C206/12, 13.8.92).

These Polysorbate non-ionic surfactants are available commercially from a variety of suppliers, for example Polysorbates 20, 40, 60 and 80 are sold by ICI as Tween 20, Tween 40, Tween 60 and Tween 80, respectively, or by Croda as Crillet 1, Crillet 2, Crillet 3 and Crillet 4, respectively, or by Seppic as Montanox 20, Montanox 40, Montanox 60, Montanox 80, respectively.

The proportions of the anionic surfactant (a), acid (b) and non-ionic surfactant (c) in the formulation are chosen to provide the best compromise between the various desired properties of the formulation (i.e. disinfectant activity, concentrate stability, and hard water stability). The upper concentration limit for the anionic surfactant (a), usually sodium lauryl sulphate, is determined by the need to incorporate the other components (particularly the acid (b) and the non-ionic surfactant (c)) into the formulations in amounts which give a suitable balance between the desired properties.

As the concentration of the sodium alkyl sulphate (a) is increased, the amount of acid (b) must be increased in order to neutralise the alkalinity of the



sodium alkyl sulphate. The disinfectant composition shows optimum disinfectant activity below pH3 (approximately).

Furthermore, as the amount of sodium alkyl sulphate is increased, the amount of non-ionic surfactant (c) must be increased in order to maintain the stability of the disinfectant composition when it is diluted in hard water. However, as the concentration of non-ionic surfactant is increased relative to the concentration of sodium alkyl sulphate (a), the biocidal properties of the disinfectant are reduced.

Likewise, lowering the concentration of sodium alkyl sulphate (a) in the formulation reduces the disinfectant activity of the formulation. The lower limit of 1% anionic surfactant (a) represents the concentration in a formulation that would be used neat, without further dilution.

The amount of the non-ionic surfactant (c) which is usually present in the disinfectant compositions of the present invention is from 1.5 to 22 wt%, advantageously from 6 to 12 wt%, preferably from 6 to 10 wt%, more preferably about 8 wt%, based on the total weight of the disinfectant composition.

The non-ionic surfactant (c) may include a proportion consisting of non-ethoxylated partial esters of sorbitan, provided that the resultant mixture remains readily soluble in water. These esters are typically sorbitan laurate, palmitate, stearate, oleate, tristearate, trioleate and sesquioleate, and are sold under the trade mark of "Crills" by Croda or as "Spans" by ICI.

Typically, the amount of the acid (b) which is present in the composition is from 2 to 28 wt%, preferably from 7 to 13 wt%, more preferably about 10 wt%, based on the total weight of the disinfectant composition.

The disinfectant compositions of the present invention are intended for use as disinfectants in food and beverage manufacturing, and are typically intended for use in cleaning and disinfecting machinery and work surfaces which have been used in the preparation of foodstuffs and beverages. They will also be suitable for use in restaurants, sandwich bars, and fast-food outlets. The

compositions are intended to be sprayed on the surfaces to be cleaned and disinfected, or to be wiped on to such surfaces, with the optional step of rinsing the surfaces after the disinfectant composition has been applied thereto.

Alternatively, equipment to be cleaned can be immersed in the disinfectant composition.

Accordingly, the various components in the disinfectant compositions of the invention must be selected so as to be compatible with foodstuffs and beverages in case traces of the disinfectant remain on the surfaces which have been treated with the disinfectant composition.

The disinfectant composition of the invention may also include as further components an antimicrobial agent (d), a solvent (e) and/or a food-compatible ammonium compound (f). The presence of one or more of these further components enables concentrated forms of the disinfectant to be stable for periods of at least a month when stored at room temperature and in some cases even when stored at temperatures down to  $-1^{\circ}\text{C}$ .

The antimicrobial agent (d) is chosen from at least one of propionic acid, calcium, sodium or potassium propionate;  $\text{C}_6 - \text{C}_{12}$  fatty acids, especially caprylic acid; benzoic acid, sodium benzoate; methyl parahydroxy benzoic acid, ethyl parahydroxy benzoic acid, propyl parahydroxy benzoic acid and their sodium salts; sorbic acid, potassium sorbate and calcium sorbate; dehydroacetic acid and sodium dehydroacetate; sodium diacetate; erythorbic acid and sodium erythorbate.

When the antimicrobial agent (d) is a  $\text{C}_6 - \text{C}_{12}$  fatty acid, such as caprylic acid, propionic acid, calcium, sodium or potassium propionate, dehydroacetic acid, sodium dehydroacetate, sodium diacetate, erythorbic acid or sodium erythorbic acid, the amount of the antimicrobial agent which is usually present in the composition is from 0.3 to 6 wt%, preferably from 1.5 to 2.5 wt%. more preferably about 2 wt%, based on the total weight of the disinfectant composition.

When the antimicrobial agent (d) is benzoic acid, sodium benzoate; methyl parahydroxy benzoic acid, ethyl parahydroxy benzoic acid, propyl parahydroxy benzoic acid or their sodium salts; sorbic acid, potassium sorbate or calcium sorbate, the amount of antimicrobial agent which is usually present in the composition is from 0.2 to 3 wt%, preferably 0.5 to 1.5 wt%, more preferably about 1 wt%, based on the total weight of the disinfectant composition. Some of these antimicrobial agents may not be soluble at the upper end of the quoted concentration ranges; accordingly, the maximum amount of these antimicrobial agents which may be incorporated in the disinfectant compositions will depend on the solubility of the antimicrobial agent.

The solvent (e) is chosen from isopropanol, ethanol, glycerol, propylene glycol, and 1,3-butylene glycol and is preferably isopropanol. The amount of the solvent which is present in the composition is usually from 0.5 to 20 wt%, preferably from 3 to 10 wt%, more preferably about 7.5 wt%, based on the total weight of the disinfectant composition.

The food-compatible ammonium compound (f) comprises an ammonium compound approved for food or beverage use chosen from ammonium citrate, ammonium phosphate, ammonium sulphate and ammonium nitrate. Ammonium sulphate is preferred. The amount of ammonium compound usually present in the composition is from 0.5 to 3.0 wt%, preferably 1.5 to 2.5 wt %, more preferably about 2 wt %.

The disinfectant compositions of the present invention are usually prepared by dissolving the various components of the composition in soft water. Usually the anionic surfactant (a) is added to the water first which is stirred or agitated until the surfactant has dissolved, whereupon the remaining ingredients are added to the resultant solution. The solution is stirred or agitated until all the ingredients have dissolved.

As indicated above, the disinfectant compositions of the present invention are liquids which are stable when diluted with hard water, usually for at least 5 to 24 hours. Furthermore, in the presence of the antimicrobial agent (d), the

solvent (e) or the ammonium compound (f), the concentrated forms of the disinfectant compositions of the present invention are normally stable for at least 2 months at room temperature. Ideally, the concentrated form of the disinfectant composition should be stable for 6 to 12 months at room temperature and for at least 2 months at temperatures down to  $-1^{\circ}\text{C}$ .

The compositions are normally sold as concentrates, to be diluted in use. Typically dilution is such that 2% by weight of the concentrate is added to water to form the end product which is to be sprayed onto, or applied manually to, e.g. by wiping, the surfaces to be cleaned and disinfected. Subsequent rinsing of the treated surfaces is not essential, but may be desirable or required by appropriate legislation imposing regulations governing food hygiene.

The invention is illustrated by the following Examples.

#### EXAMPLE 1

A disinfectant liquid composition was prepared from the following components:-

| <u>Component</u>          | <u>Quantity</u><br>(wt%) |
|---------------------------|--------------------------|
| Sodium lauryl sulphate    | 7                        |
| Citric Acid               | 10                       |
| Polysorbate 80 (Tween 80) | 8                        |
| Caprylic Acid             | 2                        |
| Isopropanol               | 3.4                      |

The anionic surfactant (sodium lauryl sulphate) was dissolved with mechanical stirring in water. The remaining ingredients were added to the resultant solution, and stirring of the solution was continued until all the ingredients had dissolved.

The resultant composition was stable for more than 3 months at ambient temperature as a concentrate and stable for more than 72 hours at ambient temperature when diluted to 2% w/w in hard water (World Health Organisation, 300 ppm as  $\text{CaCO}_3$ ).

5 A 2% w/w solution was biocidal against a range of bacteria. It was examined according to the test method proposed by CEN (European Committee for Standardization) for the evaluation of bactericidal activity of chemical antiseptics and disinfectants in food, industrial, domestic and institutional areas (see Document CEN/TC 216/WG 3 N34 E-C-4) but with the modification that  
10 the test temperature was reduced from 20°C to 10°C. The following results were obtained:

CONDITIONS : Soil, 0.3% w/v Bovine Serum Albumin  
Hard water, 300ppm as  $\text{CaCO}_3$   
Contact temperature, 10°C  
15 Contact time, 5 minutes

| ORGANISM                  | LOG REDUCTION OF VIABILITY |
|---------------------------|----------------------------|
| Pseudomonas aeruginosa    | >6.3                       |
| 20 Escherichia coli       | 5.4                        |
| Yersinia enterocolitica   | >6.3                       |
| Enterococcus faecium      | >5.9                       |
| Salmonella typhimurium    | >6.5                       |
| Staphylococcus aureus     | >6.4                       |
| 25 Listeria monocytogenes | >6.2                       |
| Bacillus cereus           | >5.2                       |

## EXAMPLE 2

30

Example 1 was repeated, but the disinfectant composition was formulated from the following components:-

| <u>Component</u>            | <u>Quantity</u><br>(wt%) |
|-----------------------------|--------------------------|
| Sodium lauryl sulphate      | 7                        |
| Citric Acid                 | 7                        |
| 5 Polysorbate 20 (Tween 20) | 8                        |
| Caprylic Acid               | 2                        |
| Isopropanol                 | 3.4                      |

This composition was also an effective food-compatible disinfectant.

10 The resultant composition was stable for more than 1 month at ambient temperature as a concentrate and was stable for more than 72 hours at ambient when diluted to 2% w/w in hard water (World Health Organisation, 300 ppm as  $\text{CaCO}_3$ ).

15 A 2% w/w solution was biocidal against bacteria and yeast according to the European Suspension Test protocol entitled "Test Methods for the antimicrobial activity of disinfectants in food hygiene" published by the Council of Europe (Strasbourg 1987). The nature of the soil was modified as shown below. The following results were obtained:-

20 CONDITIONS : Soil as shown below  
Contact temperature, 20°C  
Contact time, 5 minutes

| ORGANISM                        | SOIL  | LOG<br>REDUCTION OF<br>VIABILITY |
|---------------------------------|---|----------------------------------|
| 5 <i>Pseudomonas aeruginosa</i> | Distilled Water                               | >6                               |
|                                 | Hard Water (300 ppm as<br>CaCO <sub>3</sub> ) | >6                               |
|                                 | 300 ppm Hard Water +<br>0.03% BSA             | >6                               |
| <i>Escherichia coli</i>         | Distilled Water                               | >6                               |
|                                 | Hard Water (300 ppm as<br>CaCO <sub>3</sub> ) | >6                               |
|                                 | 300 ppm Hard Water +<br>0.03% BSA             | >6                               |
| <i>Staphylococcus aureus</i>    | Distilled Water                               | >6                               |
|                                 | Hard Water (300 ppm as<br>CaCO <sub>3</sub> ) | >6                               |
|                                 | 300 ppm Hard Water +<br>0.03% BSA             | >6                               |
| <i>Saccharomyces cerevisiae</i> | Distilled Water                               | >5                               |
|                                 | Hard Water (300 ppm as<br>CaCO <sub>3</sub> ) | >5                               |
|                                 | 300 ppm Hard Water +<br>0.03% BSA             | >5                               |

10

BSA = Bovine Serum AlbuminEXAMPLE 3

| <u>Component</u>       | <u>Quantity</u> |
|------------------------|-----------------|
|                        | (wt%)           |
| Sodium lauryl sulphate | 7               |
| Sodium benzoate        | 1.5             |
| Citric acid            | 3               |

15

12

|                           |     |
|---------------------------|-----|
| Phosphoric acid (75%)     | 3.5 |
| Polysorbate 80 (Tween 80) | 11  |
| Isopropanol               | 3.4 |

†

5           The anionic surfactant (sodium lauryl sulphate) was dissolved with mechanical stirring in water. Sodium benzoate was dissolved similarly. The remaining ingredients were added to the resultant solution and stirring of the solution was continued until all the ingredients had dissolved.

          The resultant composition was biocidal. The biocidal properties of the  
10   composition were tested as follows:-

CONDITIONS       Modified European Suspension Test  
Concentration, 2% w/w  
Soil, modified as shown below  
15   Contact Temperature, 20°C  
Contact Time, 5 minutes

| ORGANISM         | SOIL  | LOG REDUCTION OF VIABILITY |
|------------------|---|----------------------------|
| Escherichia coli | Hard Water<br>(300 ppm as CaCO <sub>3</sub> ) | >6                         |

20

#### EXAMPLE 4

Example 1 was repeated, but the disinfectant composition was formulated  
25   from the following components:-

| <u>Component</u>          | <u>Quantity</u><br>(wt%) |
|---------------------------|--------------------------|
| Sodium lauryl sulphate    | 7                        |
| 30   Citric Acid          | 10                       |
| Polysorbate 80 (Tween 80) | 8                        |



|               |     |
|---------------|-----|
| Caprylic Acid | 2   |
| Isopropanol   | 7.5 |

This composition was also an effective food-compatible disinfectant.

- 5        The resultant composition was stable for more than 6 months at ambient temperature and at -1°C as a concentrate and was stable for more than 48 hours at ambient when diluted to 2% w/w in hard water (World Health Organisation, 300 ppm as CaCO<sub>3</sub>).

- 10        The resultant composition was biocidal. The biocidal properties of the composition were tested as follows:-

- |            |   |
|------------|---|
| CONDITIONS | Modified European Suspension Test                                   |
|            | Concentration, 2% w/w in hard water (300 ppm as CaCO <sub>3</sub> ) |
|            | Soil, Bovine Serum Albumin (BSA) as shown below                     |
| 15         | Contact Temperature 10°C (bacteria)                                 |
|            | 20°C (fungi)  |
|            | Contact Time, 5 minutes (bacteria)                                  |
|            | 15 minutes (fungi)  |
|            | Bacteria, 10°C, 5 minutes   |
| 20         |   |

|    | ORGANISM                | SOIL  | LOG REDUCTION<br>OF VIABILITY |
|----|-------------------------|---|-------------------------------|
|    | Pseudomonas aeruginosa  | Hard Water (300ppm as CaCO <sub>3</sub> )<br>+ 0.03% w/v BSA<br>+ 0.3% w/v BSA  | >6<br>>6                      |
|    | Escherichia coli        | Hard Water (300ppm as CaCO <sub>3</sub> )<br>+ 0.03% w/v BSA<br>+ 0.3% w/v BSA  | >6<br>>6                      |
| 5  | Staphylococcus aureus   | Hard Water (300ppm as CaCO <sub>3</sub> )<br>+ 0.03% w/v BSA<br>+ 0.3% w/v BSA  | >6<br>>6                      |
|    | Yersinia enterocolitica | Hard Water (300ppm as CaCO <sub>3</sub> )<br>+ 0.03% w/v BSA<br>+ 0.3% w/v BSA  | >6<br>>6                      |
| 10 | Salmonella typhimurium  | Hard Water (300 ppm as CaCO <sub>3</sub> )<br>+ 0.03% w/v BSA<br>+ 0.3% w/v BSA | >6<br>>6                      |
| 15 | Enterococcus faecium    | Hard Water (300 ppm as CaCO <sub>3</sub> )<br>+ 0.03% w/v BSA<br>+ 0.3% w/v BSA | >6<br>>6                      |

|                               |   |          |
|-------------------------------|---|----------|
| <i>Listeria monocytogenes</i> | Hard Water (300 ppm as $\text{CaCO}_3$ )<br>+ 0.03% w/v BSA<br>+ 0.3% w/v BSA | >6<br>>6 |
| <i>Bacillus cereus</i>        | Hard Water (300 ppm as $\text{CaCO}_3$ )<br>+ 0.03% w/v BSA<br>+ 0.3% w/v BSA | >6<br>>6 |

5

Fungi, 20°C, 15 minutes

10

| ORGANISM                        | SOIL                                     | LOG<br>REDUCTION OF<br>VIABILITY |
|---------------------------------|--|----------------------------------|
|                                 | Hard Water (300 ppm as $\text{CaCO}_3$ ) | >6                               |
| <i>Saccharomyces cerevisiae</i> | Hard Water + 0.03% w/v BSA               | >5                               |
|                                 | Hard Water (300 ppm as $\text{CaCO}_3$ ) | >6                               |
| <i>Candida albicans</i>         | Hard Water + 0.03% w/v BSA               | >6                               |

15

**EXAMPLE 5**

Example 1 was repeated, but the disinfectant composition was  
 20 formulated from the following components:-

| <u>Component</u>            | <u>Quantity</u><br>(wt %) |
|-----------------------------|---------------------------|
| Sodium lauryl sulphate      | 7                         |
| Citric Acid                 | 10                        |
| 5 Polysorbate 80 (Tween 80) | 8                         |
| Sodium benzoate             | 1                         |
| Isopropanol                 | 7.5                       |

This component was also an effective food-compatible disinfectant.

10 The resultant composition was stable for more than 1 month at ambient temperature as a concentrate and was stable for more than 72 hours at ambient when diluted to 2% w/w in hard water (World Health Organisation, 300 ppm as  $\text{CaCO}_3$ ).

15 The resultant composition was biocidal. The biocidal properties of the composition were tested as follows:-

CONDITIONS : Modified European Suspension Test

Concentration, 2% w/w

Soil, 300 ppm Hard water

20 Contact Temperature 20°C

Contact Time, 5 minutes

| ORGANISM               | SOIL                                       | LOG REDUCTION OF<br>VIABILITY |
|------------------------|--|-------------------------------|
| Pseudomonas aeruginosa | Hard Water<br>(300ppm as $\text{CaCO}_3$ ) | >6                            |
| Staphylococcus aureus  | Hard Water<br>(300ppm as $\text{CaCO}_3$ ) | >6                            |
| 25 Escherichia coli    | Hard Water<br>(300ppm as $\text{CaCO}_3$ ) | >6                            |

**EXAMPLE 6**

Example 1 was repeated, but the disinfectant composition was formulated from the following components:-

5

| <u>Component</u>             | <u>Quantity</u><br>(wt %) |
|------------------------------|---------------------------|
| Sodium lauryl sulphate       | 7                         |
| Phosphoric Acid              | 8                         |
| 10 Polysorbate 80 (Tween 80) | 12                        |
| Ammonium sulphate            | 2                         |
| Isopropanol                  | 7.5                       |

This composition was also an effective food-compatible disinfectant.

15 The resultant composition was stable for more than 2 months at ambient temperature as a concentrate and at -1 °C and was stable for more than 48 hours at ambient when diluted to 2% w/w in hard water (World Health Organisation, 300 ppm as CaCO<sub>3</sub>).

20 A 2% w/w solution was biocidal against bacteria and yeast according to the modification of the European Suspension Test protocol entitled "Test Methods for the antimicrobial activity of disinfectants in food hygiene" published by the Council of Europe (Strasbourg 1987). The nature of the soil was modified as shown below. The following results were obtained:-

25 CONDITIONS : Soil as shown below  
Contact temperature 10 °c  
Contact Time, 5 minutes

| ORGANISMS                          | SOIL                            | LOG REDUCTION<br>OF VIABILITY |
|------------------------------------|---------------------------------|-------------------------------|
| 5<br><b>Pseudomonas aeruginosa</b> | Hard Water<br>(300ppm as CaCO ) | >6                            |
|                                    | Hard Water + 0.3%w/v<br>BSA     | >6                            |
| <b>Staphylococcus aureus</b>       | Hard Water<br>(300ppm as CaCO ) | >5.9                          |
|                                    | Hard Water +<br>0.3%w/v BSA     | >5.9                          |
| 10<br><b>Escherichia coli</b>      | Hard Water<br>(300ppm as CaCO ) | >6.3                          |
|                                    | Hard Water +<br>0.3%w/v BSA     | >6.3                          |
| <b>Saccharomyces cerevisiae</b>    | Hard Water<br>(300ppm as CaCO ) | >5.5                          |
|                                    | Hard Water + 0.3w/v<br>BSA      | 2.5                           |

15 Although preferred embodiments of the invention are described herein in detail, it will be understood by those skilled in the art that variations may be made thereto without departing from the spirit of the invention or the scope of the appended claims.

## CLAIMS

1. A disinfectant composition which is compatible with foodstuffs and  
5 beverages, said composition comprising.-
  - (a) an anionic surfactant chosen from an alkali metal salt of a  $C_{10}$  -  $C_{18}$  alkyl sulphate and an alkali metal salt of di ( $C_6$  -  $C_{10}$  alkyl) sulphosuccinate;
  - 10 (b) an acid selected from citric acid, phosphoric acid, sulphuric acid, hydrochloric acid, acetic acid, gluconic acid, lactic acid, propionic acid, malic acid and tartaric acid; and
  - (c) a non-ionic surfactant which comprises a polyethoxylated sorbitan ester which is readily soluble in water.
- 15 2. A disinfectant composition according to Claim 1, wherein the anionic surfactant is sodium lauryl sulphate and/or sodium dioctyl sulphosuccinate.
3. A disinfectant composition according to Claim 1 or 2, wherein the  
amount of the anionic surfactant (a) which is present in the composition is from  
20 1 to 20 wt%, preferably from 5 to 9 wt%, more preferably about 7 wt%, based on the total weight of the disinfectant composition.
4. A disinfectant composition according to Claim 1, 2, or 3,  
wherein the amount of the acid (b) which is present in the composition is from  
25 2 to 28 wt%, preferably from 7 to 13 wt%, more preferably about 10 wt%, based on the total weight of the disinfectant composition.
5. A disinfectant composition according to any one of the preceding  
claims, wherein the non-ionic surfactant (c) comprises a polyethoxylated  
30 sorbitan ester selected from ethoxylated sorbitan monolaurate, ethoxylated

sorbitan monopalmitate, ethoxylated sorbitan monostearate, and ethoxylated sorbitan mono-oleate.

6. A disinfectant composition according to Claim 5, wherein the  
5 polyethoxylated sorbitan ester contains 20 moles of ethylene oxide.

7. A disinfectant composition according to any one of the preceding  
claims, wherein the non-ionic surfactant (c) is chosen from at least one of  
Polysorbate 20, Polysorbate 40, Polysorbate 60 and Polysorbate 80.  
10

8. A disinfectant composition according to any one of the preceding  
claims, wherein the amount of the non-ionic surfactant (c) which is present in  
the composition is from 1.5 to 22 wt%, preferably from 6 to 10 wt%, more  
preferably about 8 wt%, based on the total weight of the disinfectant  
15 composition.

9. A disinfectant composition according to any one of the preceding  
claims, which further comprises (d) an antimicrobial agent chosen from at least  
one of propionic acid, calcium, sodium or potassium propionate; C<sub>6</sub> - C<sub>12</sub> fatty  
20 acids, preferably caprylic acid; benzoic acid, sodium benzoate; methyl  
parahydroxy benzoic acid, ethyl parahydroxy benzoic acid, propyl parahydroxy  
benzoic acid and their sodium salts; sorbic acid, potassium sorbate and calcium  
sorbate; dehydroacetic acid and sodium dehydroacetate; sodium diacetate;  
erythorbic acid and sodium erythorbate.

25  
10. A disinfectant composition according to Claim 9, wherein the  
antimicrobial agent (d) is a C<sub>6</sub> - C<sub>12</sub> fatty acid, propionic acid, calcium, sodium  
or potassium propionate, dehydroacetic acid, sodium dehydroacetate, sodium  
diacetate, erythorbic acid or sodium erythorbate, and the amount of the  
30 antimicrobial agent which is present in the composition is from 0.3 to 6 wt%,



preferably from 1.5 to 2.5 wt%, more preferably about 2 wt%, based on the total weight of the disinfectant composition.

11. A disinfectant composition according to Claim 9, wherein the  
5 antimicrobial agent (d) is benzoic acid, sodium benzoate; methyl parahydroxy benzoic acid, ethyl parahydroxy benzoic acid, propyl parahydroxy benzoic acid or their sodium salts; sorbic acid, potassium sorbate or calcium sorbate, and the amount of antimicrobial agent which is present in the composition is from 0.2 to 3 wt%, preferably 0.5 to 1.5 wt%, more preferably about 1 wt%, based on the  
10 total weight of the disinfectant composition.

12. A disinfectant composition according to any one of the preceding claims, which further comprises (e) a solvent chosen from isopropanol, ethanol, glycerol, propylene glycol, and 1,3-butylene glycol.  
15

13. A disinfectant composition according to Claim 12, wherein the solvent (e) is isopropanol.

14. A disinfectant composition according to Claim 12 or Claim 13, wherein  
20 the amount of the solvent (e) which is present in the composition is from 0.5 to 20 wt%, preferably from 3 to 10 wt%, more preferably about 7.5 wt%, based on the total weight of the disinfectant composition.

15. A disinfectant composition according to any one of the preceding  
25 claims, which further comprises (f) a food-compatible ammonium compound chosen from ammonium citrate, ammonium phosphate, ammonium sulphate and ammonium nitrate.

16. A disinfectant composition according to claim 15, wherein the amount of  
30 the food-compatible ammonium compound which is present in the composition

is from 0.5 to 3.0 wt%, preferably 1.5 to 2.5 wt%, more preferably about 2 wt%, based on the total weight of the disinfectant composition.

# INTERNATIONAL SEARCH REPORT

International Application No.

PCT/CA 95/00537

## A. CLASSIFICATION OF SUBJECT MATTER

IPC 6 A01N25/30 A01N41/02 A01N41/04

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 6 A01N

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

| Category * | Citation of document, with indication, where appropriate, of the relevant passages  | Relevant to claim No. |
|------------|---|-----------------------|
| A          | US,A,3 650 964 (R.M. SEDLIAR ET AL.) 21 March 1972<br>cited in the application<br>see column 1, line 45 - column 2, line 53<br>---                          | 1-16                  |
| A          | DE,A,32 29 097 (SCHÜLKE & MAYR) 9 February 1984<br>see claims<br>see page 11, paragraph 2<br>& CA,A,1 244 759 (ID)<br>cited in the application<br>---       | 1-16                  |
| A          | DE,A,35 19 557 (INTERKEMIA VEGYIPARI GAZDASAGI TARSASAG) 5 December 1985<br>cited in the application<br>see claim 1<br>see page 7, line 18 - line 23<br>--- | 1,5-7,<br>12-14       |
| -/--       |   |                       |

☒ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

\* Special categories of cited documents:

- \* "A" document defining the general state of the art which is not considered to be of particular relevance
- \* "E" earlier document but published on or after the international filing date
- \* "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
- \* "O" document referring to an oral disclosure, use, exhibition or other means
- \* "P" document published prior to the international filing date but later than the priority date claimed

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- \* "Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
- \* "&" document member of the same patent family

Date of the actual completion of the international search

22 December 1995

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# INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No.

PCT/CA 95/00537

| Patent document<br>cited in search report | Publication<br>date | Patent family<br>member(s) | Publication<br>date |
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# INTERNATIONAL SEARCH REPORT

International Application No.

PCT/CA 95/00537

## C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

| Category * | Citation of document, with indication, where appropriate, of the relevant passages  | Relevant to claim No. |
|------------|---|-----------------------|
| A          | <p>WO,A,92 09260 (MICROCIDE) 11 June 1992<br/> cited in the application<br/> see page 1, line 29 - page 2, line 25<br/> -----</p> | 1                     |

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